

January 1995

A National Study Sponsored by the
Federal Highway Administration

Advanced Traveler Information Systems for Rural Areas

Preliminary Concepts

In early 1993, the U.S. Federal Highway Administration (FHWA) initiated a comprehensive study of rural applications of Advanced Traveler Information Systems (ATIS). The study objectives are to guide federal programs with respect to Intelligent Transportation Systems (ITS) technologies in rural and small urban areas and to provide guidelines for ATIS implementation by state and local governments to meet rural travelers' needs.

This pamphlet is one of a series of pamphlets summarizing preliminary findings of the study. It briefly describes some preliminary concepts identified in response to the information needs of travelers in rural and small urban areas.

Background

The Rural ATIS study covers seven major topics:

- 1) a detailed assessment of user needs;
- 2) a review of relevant technology both in existence and under development;
- 3) an evaluation of the national significance of rural problems which might be addressed by ATIS technology;
- 4) the development and assessment of a range of rural ATIS concepts;
- 5) identification of high priority rural actions and preparation of a national action plan for Rural ATIS;
- 6) field tests of a few promising systems under this and subsequent projects, and
- 7) documentation of guidelines for use by state and local government agencies in implementing rural ATIS systems.

This study is being conducted by a research team led by JHK & Associates, with assistance from Virginia Tech, Hughes Aircraft, and Bell Atlantic and Olson Market Research, Inc.

Previous study tasks have established and prioritized the information needs of travelers in rural and small urban areas, evaluated the national significance of rural problems, assessed the technological opportunities available to rural ATIS, and reviewed on going initiatives. These tasks laid the groundwork for development of rural ATIS concepts. A series of concepts have subsequently been developed in response to the needs of travelers in rural and small urban areas. The concepts have been categorized into three general areas: Emergency Response, Safety and Hazard Warning, and Traveler Services Information. This pamphlet provides a brief summary of these concepts.

Emergency Response

Cellular Mayday System

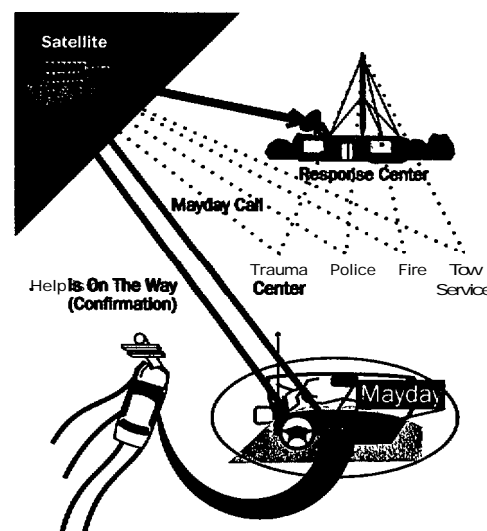
The in-vehicle cellular mayday system transmits an emergency "help" signal, through the cellular telephone communications system, to an emergency response center. An on-board GPS location device determines the vehicle coordinates and

transmits them as part of the mayday signal. The transmuted help signal will be a synthesized voice, allowing any existing emergency response center to receive and understand the help signal with no need for special equipment.

Satellite Mayday System

The in-vehicle satellite mayday system transmits an emergency "help" signal through a satellite communications system to an emergency response system. An on-board GPS location device determines the vehicle coordinates and transmits them as part of the mayday signal. The satellite mayday system is also adaptable to two-way communications, so the travelers can receive an acknowledgement that help is enroute.

Satellite Mayday System



Slow-Scan Video for Emergency Response

This concept uses slow scan video to record and transmit a visual record of the accident scene to a dispatch center and associated responder units. First responder vehicles will be equipped with portable video



cameras, one-way slow scan communication, and two-way audio communication to the agency dispatch/communications center. The video and audio records transmitted to the dispatch center will enable immediate assessment of conditions to aid in subsequent response agency alerts, actions, and victim trauma control steps.

CVO CB Samaritans

The CVO CB Samaritans concept is envisioned as a formal, cooperative program between the trucking industry and government agencies to enlist trucking firms and their drivers to report accidents, reckless driving, motorists needing assistance, and related road hazard and safety circumstances via CB radios. The program will be mounted as a public service and highway safety initiative of the trucking industry and government.

Safety and Hazard Warning

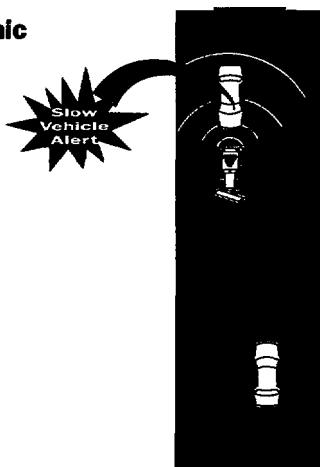
Slippery Conditions Warning System

The slippery conditions warning system uses ice detection technologies to determine when icy or slippery conditions exist on special segments of the roadway, such as bridges or low elevation pavements. The system then provides dynamic warning of those conditions to travelers. The dynamic warning attribute is a key feature of the concept, emphasizing its effectiveness over static warning signs which convey no "real time" sense of conditions to travelers.

Electronic Flare Warning System

The electronic flare warning system is an in-vehicle device, envisioned for use on slow moving construction and maintenance equipment, school buses, and emergency vehicles, which transmits warning signals

Electronic Flare

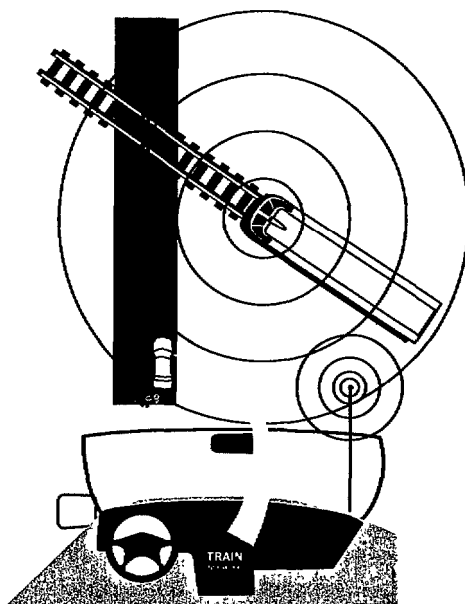


or advisory information to surrounding or approaching vehicles. The system could also be applied to construction sites (e.g. lane closure and Bagging operations). The approaching vehicle has an on-board device that receives the signal and issues an appropriate warning to the driver.

Railroad Crossing Warning System

The railroad crossing warning system is an active device to warn drivers of an oncoming train at unprotected grade railroad crossings. The concept uses a transmitter on the approaching train to send a signal to vehicles approaching the grade crossing, providing the driver with positive notification that a train is approaching.

Railroad Crossing Warning System



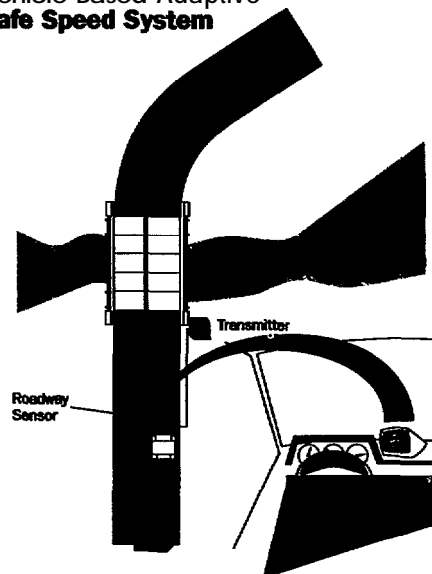
Extended Tail Light Warning System

The extended tail light concept will be made up of vehicle detectors and light sources mounted either above ground at the shoulder edge or embedded in the pavement. Passage of a vehicle will activate the lights and cause them to remain lit for a certain length of time, depending on the vehicle speed, grade, and road surface conditions. The illuminated lights will indicate the safe following distance.

Weather/Road Conditions Monitoring System Using Vehicle Probes

The weather and road condition monitoring system using vehicle probes will take advantage of vehicles equipped with advanced systems (e.g. friction factor measurement systems) and other vehicles which regularly travel segments of rural roads such as law enforcement and maintenance vehicles. These vehicles will be used to probe the rural roadway network

Vehicle-Based Adaptive Safe Speed System



for weather and road conditions. Data collected by these vehicle probes will be downloaded to roadside units, from which the data will be transmitted to travelers via CMS, roadside information systems, HAR, etc.

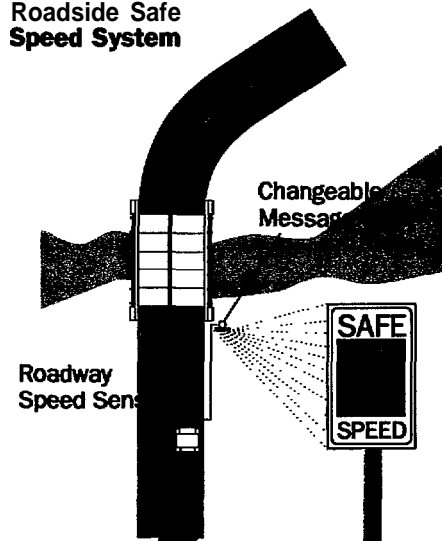
Vehicle-Based Adaptive Safe Speed System

This concept will present the driver with a recommended safe speed for given geometric conditions. The system uses information on vehicle weight, vehicle type, roadway geometry, and road surface conditions to recommend a safe speed. Static and dynamic roadway data will be combined with vehicle data in an on-board processor to compute the safe speed.

Roadside Safe Speed System

The roadside safe speed warning system will use information on vehicle characteristics, roadway geometry, and road surface

Roadside Safe Speed System



condition to recommend a safe speed. Static and dynamic roadway data will be combined with detected vehicle characteristics at a roadside processor, and a safe speed will be presented to the driver on a roadside sign.

Animal Warning System

This concept will emit a high frequency signal or signals, audible to animals but not humans, to alert animals and divert them away from the roadway. The goal of this concept is to warn animals which are large enough to cause an accident or damage a vehicle. There are products available which claim to alert animals of approaching vehicles; however, their effectiveness is unknown. It is envisioned that the animal warning system concept will initially be more of a research effort into the applicability of existing products than a development effort of a new device.

Winter Road Maintenance Management System

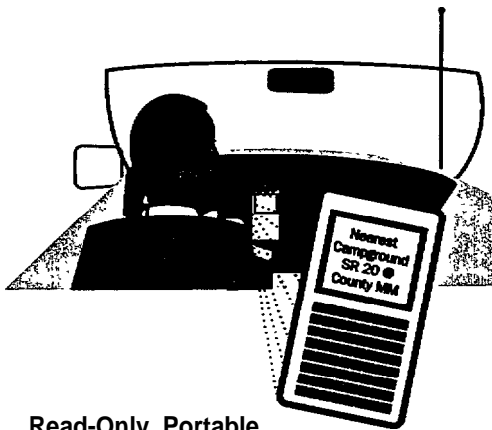
This system uses advanced roadway and weather data collection technology along with vehicle probe technologies. The system gathers detailed real-time roadway and weather condition information to guide effective scheduling of winter roadway maintenance operations. The primary purpose is to provide more pertinent and accurate data than is currently available to road maintenance personnel. The information collected by the highway agencies could also be disseminated to travelers to assist them in making travel decisions.

Work Zone Delay Advisory System

The work zone delay advisory system concept provides travelers with an active indication that delays actually exist at the work zone. The simplest type of system is a static sign with flashers which can be activated when there are delays. A second type uses speed sensors to determine approximate delay through the work zone and changeable message signs to transmit the information to travelers. A third type uses a passive automatic vehicle identification travel time monitoring system to more accurately determine delay at work zones.

CVO as Vehicle Probes

The CVO probe concept uses AVI-tagged commercial vehicles as data collection units to obtain travel time measurements between specific points along a roadway or network. The information product is quite limited (point-to-point travel time), but if enough observations are obtained, expected travel times can be defined. Deviations can then be used to signal possible incidents or unusual conditions.



Read-Only Portable Tourist Information System

Traveler Services Information

Pre-Trip Information System

The pre-trip information system concept uses existing communications technologies to provide easily accessible self-service dissemination of traveler service, routing, and advisory information. This concept is envisioned to address traveler needs during the pre-trip planning stage: trip routing, en route facilities, road conditions, weather conditions, travel time, traveler services, etc.

Read-Only Portable Tourist Information System

The read-only portable tourist information system can provide travel directions, information on lodging, dining, attractions, and motorist service in a format that the traveler can carry along and query as necessary. The system, possibly contained in a personal digital assistant, can be borrowed or rented at the trip origin (route specific database) or at the destination (regional database) and returned after the trip is complete. Regional systems could be developed for national parks and other major attractions, providing travelers with information about various points of interest within the area.

Roadside Information System (Kiosk)

The roadside information system concept uses existing kiosk technologies to provide self-service traveler advisory and service information. Using automated kiosks at roadside locations or origin/intermediate trip points to provide travel information addresses many of the en route non-emergency traveler needs.

Rural Navigation System

This in-vehicle concept will use real-time vehicle location, navigation, and a guidance system to provide specific route directions to user-selected destinations.

This is not a new idea; similar systems have been tested and used in many urban areas and are available commercially. The emphasis of this concept, though, is to provide navigation services in rural areas by development of rural databases.

Low Cost Route Diversion System

This concept, modeled after a successful strategy in the United Kingdom, uses static guide signs and route markers to define permanent alternates to primary routes with recurrent congestion problems. One or more routes are predefined as alternates to heavily traveled tourist routes and each is assigned a distinctly colored symbol identifier (e.g., triangle, square, circle, diamond). At a defined diversion point on the main route, travelers are given the option to divert and follow a specific alternate route, designated by the particular colored symbol identifier to a given destination.

In-Vehicle Information System

The in-vehicle information system concept uses an external communications infrastructure to provide in-vehicle traveler advisory and service information. Roadside transmission units broadcast local area information, which the in-vehicle unit receives and stores for traveler use. Broadcasting information that is relevant only to the immediate local area is very useful for meeting traveler advisory and traveler services needs. It can provide very current information for such dynamic subjects as traffic congestion, tourist attraction parking, and lodging availability.

Wide Area Traveler Information Center (TIC)

The concept of a wide area traveler information center is to provide a single, regional source for traveler information. The TIC will process, aggregate, and disseminate information regarding roadway and weather conditions, incidents, traveler services, and facilities. Information will be distributed to user interfaces within the

Active Logo Signing System



region, such as HAR, CMS, personal communication devices, commercial radio, and kiosks.

Active Logo Signing System

The active logo signing concept uses simple, dynamic displays on standard roadside specific service (logo) signs to indicate the status of services (e.g., open/closed, vacancy/no vacancy). The user needs survey found that rural travelers unfamiliar with an area want to know not just what services are available at a specific location, but whether service stations and restaurant are open and if lodging and camping establishments have vacancies. The active logo signing concepts adds "open/closed" or "vacancy/no vacancy" lighted indicators to the specific service signs.

Next Steps

Based on the results of the evaluation of these concepts, and recommendations of the expert panel members, a limited number of these concepts will be selected for further analysis. A detailed system analysis will then be conducted for each of the selected concepts. The analysis will include discussions of institutional, legal, and technical issues, national implications of each concept, and identification of possible initial application sites. Finally, work plans will be developed for each concept, detailing specific work activities required for deployment of each concept. Work activities will fall into three basic categories of actions: illustrative deployment/operational test, prototyping, and research and development.

TO ENQUIRE ABOUT potential public or private involvement in the testing and deployment of rural ATIS applications or for more information regarding rural ATIS, contact:

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User Needs vs. Candidate Concepts

User Needs	Visual Signs	Audio Warning	Sub-Sound (for Condition)	Traveler Actions	Traveler Information	Traveler Assistance
	Medical	Mechanical	Slippery Spots	Stopped/Slow Moving Vehicles	Animals/Objects in Road	Poor Visibility
			Downhill (Trucks)	Sharp Curve/Ramp	Work Zone	Road Closure
			Road Surface Condition	Construction /Maintenance	Incidents	Recurrent Congestion
			Directions	Lodging/Camping/Restaurant	Tourist Attractions	Motorist Services
			Dynamic Diversion	Static Diversion		
Rural ATIS Concepts						
Cellular Mayday System						
Satellite Mayday System						
Slow Scan Video for Emergency Response						
Slippery Conditions Warning System						
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Weather/Road Conditions Monitoring System Using Vehicle Probes						
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Winter Road Maintenance Management System						
Work Zone Delay Advisory System						
CVO Samaritan						
CVO es Vehicle Probes						
Active Logo Signing System						

Expert Panel

- Joe Armijo, Montana State University
- Gene Bergoffen, National Private Truck Council
- Douglas Bovin, National Association of County Officials
- Paul Cunningham, East Carolina University Medical Center
- Frank Horne, Motorist Information Services Association
- Mary Ingels, National Park Service
- John Kiljan, Colorado DOT/ ENTERPRISE
- James McLary, Community Transportation Association of America
- Susan Pikrallidas, AAA
- Rob Leicbner, Washington State Patrol
- Mike Sobelewski, Minnesota Guidestar
- John West, Caltrans



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